

and the most complete series possible of all species of which there were duplicates to be sent at once to the British Museum, and that afterwards duplicates should be arranged in sets, and distributed to museums at home and abroad, according to a scheme to be sanctioned by their lordships.

Many considerations entered into the selection of the experts, into whose hands this vast collection of new material was to be placed. As I was solely responsible to Government for the general result, I was of course obliged to undertake this duty; but I rarely trusted my own judgment, acting in most cases with the advice and sanction of one or other, the weight of whose opinion on the special question at issue would be universally recognised. My sole object was to carry out the task intrusted to me to the best of my ability, and to prepare and to submit to Government the most complete report possible, and I asked the co-operation of men who, in my judgment, were the most likely to insure this result. I have to acknowledge, with profound gratitude, the frank readiness with which almost every appeal for assistance was responded to, and it is a matter of great satisfaction to me that the plan of work, which is the result of these arrangements, has elicited an expression of general approval from nearly all of those to whose opinion on such a question I attach the highest value.

From what I see at present the official account of the voyage of H.M.S. *Challenger* may be expected to extend to from fourteen to sixteen quarto volumes of 500 or 600 pages, the whole illustrated by about 1,200 lithographed plates, and many charts, woodcuts, and photographs. The MSS. of the first volume, which will contain a general account of the voyage, the hydrographic details contributed by Staff-Commander Tizard, the head of the Naval Surveying Staff on board, is nearly completed, and the charts of the ship's course and the sections showing the vertical distribution of ocean temperature which illustrate this volume, are in course of preparation. The second volume will consist chiefly of tables, and will include a report on the magnetic observations made during the voyage, drawn up under the superintendence of the Hydrographer to the Navy; and a detailed report on the meteorology, prepared by Capt. Tizard. The greater part of this volume is already in print, and I place before you a copy of the Magnetic Report, which will give an idea of the general appearance of the book.

Another volume will contain the discussion of the nature and composition and source of the deposits forming at the bottom of the sea, the composition and specific gravity of the sea-water, and the proportions of its contained gases, and sundry other questions, chemical and physical; and the remainder of the work will be occupied by a series of memoirs by different authors on the various groups of animals which constitute the deep-sea fauna. A large number of these monographs are in progress, and I hold in my hand a series of about 150 plates of natural objects which are now on the stone.

Only one department is finished; and I have here to record my special obligation to my friend Mr. Thomas Davidson for a most complete and thorough memoir on the *Brachiopoda* of the expedition. Mr. Davidson has not only figured all the species himself with the utmost care, but he has added to his descriptions of the *Challenger* forms a discussion of the relations which they bear, in structure and distribution, to all other known living forms, which greatly enhances the value of his monograph.

The illustration of the *Foraminifera* has been undertaken by Mr. Henry Brady, and a rapidly-thickening pile of plates testifies to the diligence of his artist, Mr. Hollick.

This plate represents several forms of a remarkable little group of Rhizopods in some ways intermediate between the *Foraminifera* and the *Radiolaria*, to which we have given the name *Challengerida*, as the twenty or thirty species of which the group is composed seem hitherto to have escaped observation.

A splendid memoir by Prof. Haeckel, on the *Radiolaria*, is in progress, and will be illustrated by upwards of a hundred plates. Everyone acquainted with Haeckel's classical work, "*Die Radiolarien*," will appreciate our good fortune in having secured his co-operation.

The next series of plates prepared under the direction of Mr. Moseley represent the deep-sea corals, and the next series, also by Mr. Moseley, illustrate a most remarkable series of coralloid forms of *Hydrozoa*, on whose structure and relations Mr. Moseley's careful work during the voyage and since our return has thrown quite unexpected light. The normal *Hydrozoa* are in the hands of Prof. Allman, but owing to our having already

secured for other departments the services of nearly all the available British artists experienced in natural-history drawing, he has not been able as yet to make much progress. Prof. Haeckel will describe the deep-water *Medusa*, few in number, but of the highest interest.

Echinodermata are very abundant in the abyssal region. I have undertaken to describe a portion of the first class of this type, the Stalked Crinoids, and upwards of twenty plates are on the stone, illustrating their structure. The drawings are by Mr. William Black, one of the most successful students in the Edinburgh School of Art under the Science and Art Department, and now an accomplished natural-history draughtsman. And Mr. Herbert Carpenter takes up the *Comatulide*, a group rich in undescribed species, which he is studying, along with the valuable collection procured by Prof. Semper in the Philippines.

Prof. Alexander Agassiz is progressing rapidly with the *Echinidea*, and his monograph, exquisitely illustrated as all these American memoirs are, will probably be among those first finished. Mr. Lyman is working at the *Ophiuridea*, which he says are very numerous and almost all new, and I expect Mr. Théel, of Upsala, to come over shortly to examine the *Holothuridea*, which he is going to describe under the general superintendence of Prof. Lovén. The Swedish Arctic Expeditions have already yielded some of the most characteristic abyssal forms of this group, and these we know through the excellent memoirs of Mr. Théel.

This bundle of beautiful plates drawn under the eye of Mr. Busk, illustrate the *Polyzoa*, a group which descends to the greatest depths, represented by many undescribed and characteristic genera.

Dr. McIntosh is working out the *Annelida*, and will require a volume to himself, while several hands are occupied with the *Crustacea*, Mr. Spence Bate taking the heaviest part of the work in the *Macroura*, Prof. George Brady describing the *Copepoda* and *Ostracoda* with many beautiful plates, some drawn by himself and others with the assistance of artists; and Prof. Huxley dealing with the *Anomoura*, which some of his recent investigations have given for him a special interest. Mr. R. Boog Watson undertakes the lower *Mollusca*, a heavy task involving the steady work of a year or two, and a ponderous volume, in which he receives the friendly assistance of our colleague, Dr. Gwyn Jeffreys, Mr. Edgar Smith, and other conchologists here and elsewhere; and Prof. Huxley closes the Invertebrates with a monograph of the *Cephalopoda*, culminating in a gem of a memoir on the structure of *Spirula*, the drawings done by his own hand from the careful dissection of the single specimen which we procured.

Brief descriptions of the deep-sea fishes have already been published by Dr. Günther, and the final memoir is in preparation; the birds in which group there are a comparatively small number, are in the charge of Dr. Sclater; and some anatomical details involving important additions to our knowledge of the structure of the *Cetacea*, the *Marsupialia*, and the Penguins have been worked out by Prof. Turner, Prof. Morrison Watson, and Dr. Cunningham.

It will be seen that in the foregoing notes many important groups of marine invertebrates are still unaccounted for. These are cases in which it has not yet been found possible to commence work from want of artists or some other cause, or in which the naturalists engaged have not yet reported progress. I have every hope that all will be under way in the course of another year.

Perhaps I have said enough to show that a report is in progress of preparation, which may be expected to register in a suitable form the results of a great scientific expedition. Some causes of delay have occurred, and there has been the regulation amount of friction inseparable from the working of a complicated piece of machinery, but my feeling is that on the whole things are going on wonderfully well, and the utmost I anticipate is the necessity for a little extension of time for the appearance of the later volumes.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

DR. MANSFIELD MERRIMAN, author of the "*Elements of the Method of Least Squares*," and for several years past an instructor in the Sheffield Scientific School of Yale College, has accepted the Professorship of Civil and Mechanical Engineering

in Lehigh University, Bethlehem, Penn., and enters upon his duties there at the beginning of the September term.

WE noticed recently the death of Prof. Behn, president of the Kaiserliche Leopoldina-Carolina Deutsche Akademie der Naturforscher. The Academy has chosen as his successor for a term of ten years, Prof. H. Knoblauch, of Halle, well known by his researches on light. With this new election, the headquarters of the Academy are changed from Dresden to Halle.

SCIENTIFIC SERIALS

American Journal of Science and Arts, July.—In his ninth paper of "Contributions to Meteorology" (based chiefly on observations of the U.S. signal service), Prof. Loomis shows, *inter alia*, that barometric waves often travel from the Pacific Coast across the Rocky Mountains (10,000 feet) and reach the Mississippi valley with but little modification. Areas of unusually high pressure in their course eastwards are generally accompanied by areas of low pressure both on the east and west sides, and at an average distance of about 1,200 miles. When a centre of low pressure has passed the wind sets in with force from the north, and being deflected westwards by the earth produces condensation there. Again, it is shown that an area of low barometer in Ireland is usually accompanied by one of high barometer in Southern or South-eastern Europe, and that during the colder months Vienna is generally near the centre of this high area, which is replenished by air rising from the area of low pressure.—Mr. Goldmark finds, from experiment, that a rise in temperature produces a slight but constant increase in the electric potential of the air.—A new and remarkable mineral locality (for manganesian phosphates) in Fairfield County, Connecticut, is described by Messrs. Brush and Ed. Dana. No less than six new and well-defined species have been got from it, besides many other known but rare species. All the minerals are obtained from veins of albitic granite.—Prof. Mayer claims independent invention of the sound-mill (lately described by M. Drorak); Mr. Chester describes some artificial crystals of gold and gold amalgam, and Prof. Rood suggests a form of telephonic relay.

August.—This opens with the first portion of an interesting lecture by Prof. Asa Gray on "Forest Geography and Archaeology." The forest production of America is sketched and considered in its relation to climatic conditions.—Prof. Leconte gives an account of the structure and origin of mountains, and answers some recent objections to the "contractional theory."—The presence of a solid hydrocarbon in the trap-rocks of New Jersey Mr. Russell accounts for by infiltration of petroleum into cavities and subsequent evaporation and (to some extent) oxidation.—Prof. Trouvelot gives an account of his observations of the recent transit of Mercury at Cambridge, Mass. Among other points noted are the luminous ring round Mercury observed distinctly for more than two hours, and the rounding off of the angles formed by the sun's limb with Mercury after internal contact, a phenomenon of the same nature as the black drop (which was not seen).—Prof. Peters indicates the position of the new planet he discovered lately.

SOCIETIES AND ACADEMIES

GENEVA

Physical and Natural History Society, June 6.—Prof. F. A. Forel, wishing to explain the action of the seiches of the Lake of Geneva, seeks to establish the effects of storms, which often coincide with marked oscillation of the fluid mass. He is still continuing his investigations.—Prof. Schiff described his researches on the alterations which the blood undergoes in consequence of a momentary arrest of the circulation.—M. Phil. Plantamour has studied periodical displacements in the air-bulb of improved levels manufactured at Geneva and placed in the cellar of his house. At certain times there is shown a slow change towards the east, without sensible return towards the west; at other times the immobility is complete. The maximum of eastern elevation takes place sometimes towards 5 P.M., at other times sooner, towards mid-day, with oscillations the amplitude of which does not exceed seventeen seconds.

July 4.—M. Eug. Demole presented phenomena of oxidation produced by the free oxygen of the air. Thus the case was presented of dibromic ethylene.—Prof. Forel, by increasing the rate of the unrolling of the paper of his limnograph, has attained

interesting traces corresponding to the perpetual oscillations of the level of the Lake of Geneva. These oscillations vary from half a minute to two or three minutes in maximum, corresponding neither with the duration of the waves nor with those of the seiches. They vary notably in intensity with the agitation of the lake by the wind or by a steamer, but their cause is yet totally unknown.

VIENNA

Imperial Academy of Sciences, July 11.—The following among other papers were read:—On the nature of galvanic polarisation, by Dr. Exner.—Optical investigation of spark-waves, by Prof. Mach and Dr. Gruss.—On the optical properties of soot, by Dr. Rosicky.—Researches on the origination of chlorophyll-granules, by Dr. Mikosch.—On two new isomeric cyanide acids, by Herr Herzig.—On the elastic reaction in glass, by Herr Klemencie.—On the composition of cinchonin, and on its oxidation products, by Dr. Strass.—Action of oxidising agents on some hydrocarbons, by Herr Othman and Zeidler.—On camphor chlorides, by Dr. Spitzer.—On a camphene derived from camphor, and the synthesis of its homologues, by the same.

PARIS

Academy of Sciences, September 2.—M. Fizeau, president, in the chair.—The following papers were read:—Formation of a cylinder out of a circular disc, by M. Tresca.—Litter manure, by M. Ch. Brame.—On the influence of the quantity of blood contained in the muscles on their irritability, by M. J. Schmoulewitsch. The author has proved that the muscles, on becoming anæmic, do not lose their irritability at once; on the contrary, it increases for some time, and having attained a certain degree, begins to decrease.—On the existence of an intra-Mercurial planet observed during the solar eclipse of July 29, by Prof. Watson. M. Gaillot is investigating the results of Prof. Watson's observations.—On the diffusion of cerium, lanthanum, and didymium, by M. Cossa.—On the causes of the humming of insects, by M. J. Pérez. The author finds that among hymenoptera and diptera, humming is due to two distinct causes; one, the vibrations of which the articulation of the wing is the seat, and which constitute the true hum; the other, the friction of the wings against the air, an effect which more or less modifies the former. Among the powerful-winged lepidoptera, such as the Sphinxes, the sweet and mellow hum of these insects is due only to the rustling of the wings by the air. This sound, always grave, is the only one produced; it is not accompanied by basilar beatings, on account of a peculiar organisation, and especially on account of the presence of scales. Among the Libellula, the base of whose wings is provided with soft and fleshy parts, there does not exist true humming, but a simple noise due to the rustling of the organs of flight.—Application of borax to researches in vegetable physiology, by M. Schnetzler.

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